

## CLAIMS

What is claimed is:

~~Sub C1~~ 1. An extraordinary magnetoresistance (EMR) magnetic head, comprising:  
2 a first shield and a second shield defining a gap adapted for being positioned over  
3 a magnetic recording disk; and  
4 an EMR sensor positioned between the first shield and the second shield;  
5 wherein a plane in which the EMR sensor is positioned is perpendicular to  
6 magnetic flux associated with the magnetic recording disk.

1 2. The magnetic head as recited in claim 1, wherein the EMR sensor includes a  
2 semiconductor material with impurities imbedded therein.

1 3. The magnetic head as recited in claim 2, wherein the impurities include doping.

1 4. The magnetic head as recited in claim 2, wherein the impurities include Au.

1 5. The magnetic head as recited in claim 1, and further comprising a first insulator  
2 layer positioned between the first shield and the EMR sensor, and a second  
3 insulator layer positioned between the second shield and the EMR sensor.

1 6. The magnetic head as recited in claim 1, wherein a current is applied to a pair of  
2 current contacts positioned on the EMR sensor.

1 7. The magnetic head as recited in claim 6, wherein the plane is defined by a flow of  
2 the current.

1 8. The magnetic head as recited in claim 6, wherein the plane is defined by a sensing  
2 field associated with the EMR sensor.

1 9. The magnetic head as recited in claim 6, wherein magnetic fields associated with  
2 the magnetic recording disk reside in the shields to afford a voltage in the EMR  
3 sensor upon an application of the current via the current contacts.

1 10. The magnetic head as recited in claim 9, wherein a pair of voltage contacts is  
2 positioned on the EMR sensor for monitoring the voltage.

1 11. The magnetic head as recited in claim 1, wherein a width of the shields at a first  
2 point on the shields proximate to the magnetic recording disk is less than a second  
3 point on the shields distant the magnetic recording disk.

1 12. The magnetic head as recited in claim 11, wherein the first point on the shield  
2 defines a trackwidth.

1 13. The magnetic head as recited in claim 11, wherein at least a portion of the side  
2 edges of the shields taper outwardly from the first point to the second point on the  
3 shields.

1 14. The magnetic head as recited in claim 11, wherein the EMR sensor is positioned  
2 at the second point on the shields.

1 15. The magnetic head as recited in claim 1, wherein the first and second shields are  
2 constructed from a ferromagnetic material.

1 16. A system, comprising:  
2 a magnetic recording disk;  
3 an extraordinary magnetoresistance (EMR) sensor including a semiconductor  
4 material with Au imbedded therein;  
5 means for positioning a plane in which the EMR sensor is positioned  
6 perpendicular to magnetic flux associated with the magnetic recording disk.

1 17. A system, comprising:  
2 a magnetic recording disk;  
3 an extraordinary magnetoresistance (EMR) sensor including a semiconductor  
4 material with Au imbedded therein;

5           a supporting structure coupled to the EMR sensor for positioning the EMR sensor  
6   over the magnetic recording disk such that a plane in which the EMR sensor is positioned  
7   is perpendicular to magnetic flux associated with the magnetic recording disk.

1   18.    A method of manufacturing an extraordinary magnetoresistance (EMR) magnetic  
2   head, comprising:

3           positioning a EMR sensor between a first and a second shield for being situated  
4   over a magnetic recording disk;  
5           wherein a plane in which the EMR sensor is positioned is perpendicular to  
6   magnetic flux associated with the magnetic recording disk.

1   19.    A disk drive system, comprising:  
2           a magnetic recording disk;  
3           an extraordinary magnetoresistance (EMR) head including:  
4            a first shield and a second shield defining a gap adapted for being  
5   positioned over the magnetic recording disk, and  
6            an EMR sensor positioned between the first shield and the second shield,  
7           wherein a plane in which the EMR sensor is positioned is perpendicular to  
8   magnetic flux associated with the magnetic recording disk;  
9           an actuator for moving the EMR read head across the magnetic recording disk so  
10   the EMR read head may access different regions of magnetically recorded data on the  
11   magnetic recording disk; and

12           a controller electrically coupled to the EMR read head for detecting changes in  
13           resistance of the EMR read head.

1       20.    An extraordinary magnetoresistance (EMR) magnetic head, comprising:  
2           a first shield and a second shield constructed from a ferromagnetic material  
3           adapted for being positioned over a magnetic recording disk;  
4           an EMR sensor positioned between the first shield and the second shield, the  
5           EMR sensor including a semiconductor material with impurities imbedded therein;  
6           a first insulator layer positioned between the first shield and the EMR sensor;  
7           a second insulator layer positioned between the second shield and the EMR  
8           sensor; and  
9           a pair of current contacts positioned on the EMR sensor for applying a current  
10          through the EMR sensor, the flow of current through the EMR sensor defining a plane;  
11          wherein the EMR sensor is positioned between the first shield and the second  
12          shield such that the plane is perpendicular to magnetic flux associated with the magnetic  
13          recording disk.